

CHAPTER 1

INTRODUCTION

1-1. Purpose. This manual presents guidance for selecting and designing foundations and associated features for buildings, retaining structures, and machinery. Foundations for hydraulic structures are not included. Foundation design differs considerably from design of other elements of a structure because of the interaction between the structure and the supporting medium (soil and/or rock).

1-2. Scope. Information contained herein is directed toward construction usually undertaken on military reservations, although it is sufficiently general to permit its use on a wide variety of construction projects.

a. This manual includes-

(1) A brief summary of fundamental volumetric - gravimetric relationships.

(2) Summaries of physical and engineering properties of soil and rock.

(3) General descriptions of field and laboratory investigations useful for foundation selection and design.

(4) Design procedures for construction aspects, such as excavated slopes and shoring.

(5) Empirical design equations and simplified methods of analysis, including design charts, soil property-index correlations, and tabulated data.

(6) Selected design examples to illustrate use of the analytical methods.

b. Since the user is assumed to have some familiarity with geotechnical engineering, design equations and procedures are presented with a minimum of theoretical background and no derivations. The topics of dewatering and groundwater control, pile foundations, and foundations on expansive soils are covered in greater depth in separate technical manuals and are only treated briefly in this manual.

1-3. Objectives of foundation investigations. The objectives of foundation investigations are to determine the stratigraphy and nature of subsurface materials and their expected behavior under structure loadings and to permit savings in design and construction costs. The investigation is expected to reveal adverse subsurface conditions that could lead to construction difficulties, excessive maintenance, or possible failure of the structure. The scope of investigations depends on the nature and complexity of sub-surface materials and the size, requirements for, and cost of the structure.

1-4. Report of subsurface and design investigations. The report should contain sufficient description of field and laboratory investigation, subsurface conditions, typical test data, basic assumptions, and analytical procedures to permit detailed review of the conclusions, recommendations, and final design. The amount and type of information to be presented shall be consistent with the scope of the investigation. For some structures, a cursory review of foundation conditions may be adequate. For major structures, the following outline shall be used as a guide:

a. A general description of the site, indicating principal topographic features in the vicinity. A plan map that shows the surface contours, the location of the proposed structure, and the location of all borings should be included.

b. A description of the general and local geology of the site, including the results of the geological studies.

c. The results of field investigations, including graphic logs of all foundation and borrow borings, locations of and pertinent data from piezometers, and a general description of subsurface materials, based on the borings. The information shall be presented in accordance with Government standards. The boring logs should indicate how the borings were made, type of sampler used, split-spoon penetration resistance, and other field measurement data.

d. Groundwater conditions, including data on seasonal variations in groundwater level and results of field pumping tests, if performed.

e. A general description of laboratory tests performed, range of test values, and detailed test data on representative samples. Atterberg limits should be plotted on a plasticity chart, and typical grain-size curves on a grain-size distribution plot. Laboratory test data should be summarized in tables and figures as appropriate. If laboratory tests were not performed, the basis for determining soil or rock properties should be presented, such as correlations or reference to pertinent publications.

f. A generalized geologic profile used for design, showing properties of subsurface materials and design values of shear strength for each critical stratum. The profile may be described or shown graphically.

g. Where alternative foundation designs are prepared, types of foundations considered, together with evaluation and cost data for each.

h. A table or sketch showing the final size and depth of footings or mats and lengths and types of piles, if used.

i. Basic assumptions for loadings and the computed factors of safety for bearing-capacity calculations, as outlined in chapter 6.

j. Basic assumptions, loadings, and results of settlement analyses, as outlined in chapters 5, 6, and 10;

also, estimated swelling of subgrade soils. The effects of computed differential settlements, and also the effects of swell, on the structure should be discussed.

k. Basic assumptions and results of other analyses.

l. An estimate of dewatering requirements, if necessary. The maximum anticipated pumping rate and flow per foot of drawdown should be presented.

m. Special precautions and recommendations for construction. Possible sources for fill and backfill should also be given. Compaction requirements should be described.